

CLAIMS

The invention claimed is:

1. A liquid mixing collector for capturing and mixing liquid descending from an overlying zone in a mass transfer or heat exchange column, the collector comprising:

at least first and second sumps;

at least one opening positioned in at least one of said first and second sumps through which liquid can drain from the at least one sump when present therein;

at least two liquid collection regions at least partially bounded by said first and second sumps;

first and second sets of spaced apart liquid collection channels associated with each of said liquid collection regions;

ascending vapor flow channels in a spacing between the liquid collection channels in each of said liquid collection regions;

a plurality of upwardly extending deflectors having surfaces for directing liquid when descending from said overlying zone into said liquid collection channels; and

drain openings positioned in said liquid collection channels to allow liquid to drain from said liquid collection channels when present therein,

wherein said first set of liquid collection channels are associated with said first sump to allow liquid, when present in the first collection

channels, to preferentially flow through said drain openings of the first set of liquid collection channels into said first sump for mixing therein and said second set of liquid collection channels are associated with said second sump to allow liquid, when present in the second collection channels, to preferentially flow through said drain openings of the second set of liquid collection channels into said second sump for mixing therein.

2. The liquid collector of claim 1, including at least one of said openings positioned in both of said first and second sumps.

3. The liquid collector of claim 2, including a downcomer associated with each of said openings in the first and second sumps to direct liquid when draining through said openings into an underlying zone.

4. The liquid collector of claim 1, wherein said first and second sumps are positioned within a common horizontal plane.

5. The liquid collector of claim 4, wherein said first and second sumps are chordal sumps.

6. The liquid collector of claim 5, wherein said first and second sumps each have opposed first and second ends.

7. The liquid collector of claim 6, including an annular sump in liquid flow communication with the first end of said first sump and an opposite second end of said second sump.

8. The liquid collector of claim 7, including a first flow restrictor positioned at the second end of said first sump to impede liquid flow between the second end of said first sump and the annular sump and a second flow restrictor positioned at the first end of the second sump to impede liquid flow between the first end of the second sump and the annular sump.

9. The liquid collector of claim 8, including a third flow restrictor positioned in the annular sump at a location adjacent the first end of the first sump to direct a portion of liquid, when present in said annular sump, into said first end of the first sump and a fourth flow restrictor positioned in the annular sump at a location adjacent the second end of the second sump to direct another portion of liquid, when present in said annular sump, into said second end of the second sump.

10. The liquid collector of claim 9, wherein said first and second sets of liquid collection channels extend in parallel relationship in a common horizontal plane.

11. The liquid collector of claim 10, wherein said first and second sumps extend in parallel and spaced-apart relationship and said first and second sets of liquid collection channels extend in perpendicular relationship to said first and second sumps.

12. The liquid collector of claim 11, wherein said first set of liquid collection channels are interspersed in an alternating fashion with said second set of liquid collection channels.

13. The liquid collector of claim 12, wherein said liquid collection channels have opposed ends and said drain openings comprise an open one of said opposed ends.

14. The liquid collector of claim 12, wherein said liquid collection channels each comprise spaced apart side walls and a connecting floor and wherein said liquid collection channels overlie said sumps.

15. The liquid collector of claim 14, wherein said drain openings are formed in said side walls of at least some of the liquid collection channels.

16. The liquid collector of claim 14, wherein said drain openings are formed in said floor of at least some of the liquid collection channels.

17. The liquid collector of claim 16, including a third chordal sump positioned in parallel and coplanar relationship to said first and second sumps.

18. The liquid collector of claim 6, including a third chordal sump positioned in parallel and coplanar relationship to said first and second sumps and wherein said liquid collection channels overlie said first, second and third sumps.

19. The liquid collector of claim 18, wherein said liquid collection channels each comprise side walls and a connecting floor and wherein said drain openings are formed in said side walls and/or said floor.

20. The liquid collector of claim 9, including a third chordal sump spaced between said first and second sumps in parallel and coplanar relationship to said first and second sumps and including at least one of said openings in said third chordal sump.

21. The liquid collector of claim 20, including additional flow restrictors at opposite ends of said third chordal sump to impeded liquid flow between said opposite ends and said annular sump.

22. The liquid collector of claim 1, wherein said first sump is an annular sump and said second sump is a chordal sump.

23. The liquid collector of claim 22, wherein said opening is located in said chordal sump and said annular sump is in liquid flow communication with opposite ends of said chordal sump to feed liquid, when present in said annular sump, to said opposite ends of said chordal sump.

24. The liquid collector of claim 1, wherein said first and second sumps are intersecting chordal sumps and including an annular sump in liquid flow communication with opposite ends of said first sump.

25. The liquid collector of claim 24, including a flow restrictor positioned at an area of intersection of said first and second sumps, wherein said flow restrictor extends diagonally across said area of intersection to redirect liquid when flowing in one portion of said second sump into one portion of said first sump and to redirect liquid when flowing in another portion of said second sump into another portion of said first sump, wherein at least one of said openings is positioned in both of said portions of said first sump.

26. The liquid collector of claim 25, including additional flow restrictors at opposite ends of said second chordal sump to impede liquid flow between said annular sump and said second chordal sump.

27. The liquid collector of claim 26, including additional flow restrictors positioned in said annular sump at locations adjacent the opposite ends of said first sump to direct portions of liquid, when present in said annular sump, into said opposite ends of said first sump.

28. The liquid collector of claim 27, wherein said first and second sets of liquid collection channels extend in parallel relationship in a common horizontal plane.

29. The liquid collector of claim 27, wherein said liquid collection regions comprise pie-shaped quadrants and wherein said first and second sets of liquid collection channels in each quadrant extend in opposite directions to the liquid collection channels in adjacent quadrants.

30. The liquid collector of claim 27, wherein said liquid collection channels have opposed ends and said drain openings comprise an open one of said opposed ends.

31. A method of collecting and mixing descending liquid in a mass transfer column, said method comprising the steps of:

collecting descending liquid in a plurality of liquid collection channels positioned within two or more horizontally distributed liquid collection regions;

preferentially directing a first quantity of liquid from a first set of said liquid collection channels in at least one of said liquid collection regions into a first sump and preferentially directing a second quantity of liquid from a second set of said liquid collection channels in said at least one liquid collection region into a second sump; and

draining said liquid from said first and second sumps.

32. The method of claim 31, including the step of directing generally equal amounts of liquid in said at least one liquid collection region into said first and second sumps.

33. The method of claim 32, including the step of using angled deflectors to deflect descending liquid into said liquid collection channels.

34. The method of claim 33, including the step of passing ascending vapor upwardly through vapor passages located between said liquid collection channels.

35. The method of claim 34, including the step of positioning said angled deflectors to shield said vapor passages from said descending liquid.

36. The method of claim 32, wherein said step of preferentially directing said first and second quantities of liquid comprises the step of draining said liquid through drain openings positioned in said liquid collection channels.

37. The method of claim 32, including the steps of preferentially directing a quantity of liquid from a first set of said liquid collection channels in a second one of said liquid collection regions into said first sump and preferentially directing a second quantity of liquid from a second set of said liquid collection channels in said second liquid collection region into an annular sump and preferentially directing a quantity of liquid from a first set of said liquid collection channels in a third one of said liquid collection regions into said second sump and preferentially directing a second quantity of liquid from a second set of said liquid collection channels in said third liquid collection region into said annular sump, wherein said first and second quantities of liquid are generally equal in amount.

38. The method of claim 32, including the steps of draining said liquid in the second sump into said first sump and draining said liquid in the first sump into an underlying zone within the mass transfer column.